# Managing a Ruptured Giant Abdominal Aortic Aneurysm with Aortocaval Fistula

## Rüptüre Dev Abdominal Aort Aort Anevrizmasının Aortokaval Fistül ile Tamiri

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**ABSTRACT**

Aortocaval fistula (ACF) is an unusual complication of ruptured abdominal aortic aneurysm (AAA), involving less than 6% of all ruptured cases. There are only a few reports on giant AAA with ACF in the literature review. A 52-year-old gentleman presented with sudden onset of lower abdominal pain radiating to the back. On examination, he was tachycardic but otherwise hemodynamically stable. A non-tender pulsatile abdominal mass was found during the examination. An infrarenal giant AAA with a maximal anteroposterior diameter of 13 cm in size involving the bilateral common iliac arteries (CIA) was detected. A ruptured AAA with a possible ACF was diagnosed, and an open abdominal aortic aneurysm repair was decided as an emergency. Intraoperatively, upon opening the aneurysmal sac, there was excessive venous bleeding, which turned out to be from the inferior vena cava (IVC) revealing an ACF between the right CIA to IVC was revealed. The fistula defect on the IVC was repaired with a Prolene 6/0 suture. Subsequently, an aorto-bifemoral graft (16 x 7 mm) bypass was performed due to a calcified iliac vessel. Ruptured giant AAA with ACF is a life-threatening emergency that needs rapid planning and intervention. The decision for an open or endovascular approach should be based on clinicians' experiences and the availability of resources. In open surgery, various methods can be used to control the bleeding from IVC, and it is paramount that clinicians are aware of this to prevent exsanguination during surgery.

**Keywords:** Abdominal aortic aneurysm; endovascular procedures; fistula; ruptured aneurysm

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**ÖZET**

Aortokaval fistül (ACF), tüm rüptüre vakaların %6'sından azını içeren, rüptüre abdominal aort anevrizmasının (AAA) alışılmadık bir komplikasyonudur. Literatür taramasında ACF'li dev AAA hakkında sadece birkaç rapor bulunmaktadır. 52 yaşında bir beyefendi ani başlayan sırta yayılan alt karın ağrısı şikayeti ile başvurdu. Muayenede taşikardikti ancak bunun dışında hemodinamik olarak stabildi. Muayenede karında hassas olmayan pulsatil kitle saptandı. Bilateral ana iliak arterleri (CIA) tutan, maksimum ön-arka çapı 13 cm olan infrarenal dev AAA saptandı. Olası bir ACF ile rüptüre AAA teşhisi kondu ve acil olarak açık abdominal aort anevrizması onarımına karar verildi. İntraoperatif anevrizmal kese açılırken aşırı venöz kanama olduğu ve bunun inferior vena kavadan (IVK) olduğu ortaya çıktı ve sağ CIA ile IVC arasında ACF ortaya çıktı. IVC'deki fistül defekti Prolene 6/0 sütür ile onarıldı. Akabinde iliak damarda kireçlenme olması nedeniyle aorto-bifemoral greft (16 x 7 mm) baypas uygulandı. ACF'li rüptüre dev AAA, hızlı planlama ve müdahale gerektiren, yaşamı tehdit eden bir acil durumdur. Açık veya endovasküler yaklaşım kararı, klinisyenlerin deneyimlerine ve kaynakların mevcudiyetine dayanmalıdır. Açık cerrahide, IVC'den kanamayı kontrol etmek için çeşitli yöntemler kullanılabilir ve ameliyat sırasında kanamayı önlemek için klinisyenlerin bunun farkında olması çok önemlidir.

**Anahtar Sözcükler:** Abdominal aort anevrizması; endovasküler prosedürler; fistül; yırtılmış anevrizma

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## INTRODUCTION

Aortocaval fistula (ACF) is a rare complication of abdominal aortic aneurysms (AAA), associated with high morbidity and mortality. The risk of AAA rupture increases with aneurysmal diameter, typically, diameters ≥5.5 cm which warrants intervention (1). It is thought that increased tension in the walls of large aneurysms can cause an inflammatory reaction. Subsequently, this can result in adhesion to the adjacent vein and culminate in necrosis of the adherent layers and fistula formation. Once a diagnosis is made, prompt intervention is vital to prevent the associated mortality and morbidity. Herein, we report a case of ruptured giant AAA (13 cm) with concomitant ACF, treated with conventional open repair.

## CASE REPORT

A 52-year-old gentleman presented with a sudden onset of lower abdominal pain radiating to the back. On examination, he was tachycardic but otherwise hemodynamically stable. A non-tender pulsatile abdominal mass was found during the examination, which turned out to be an infrarenal giant AAA with a maximal anteroposterior diameter of 13 cm in size which involves bilateral common iliac arteries (CIA) (Figure 1). The IVC was also enhanced and dilated suggestive of ACF.

The ACF communication is seen arising from the right common iliac artery, as evidenced by dilated IVC and the iliac vein proximal to that site. However, the patient did not manifest any signs of heart failure. The patient has had hypertension for 12 years on medication and denied any other medical comorbidities. The diagnosis of a ruptured AAA with a possible ACF was made and he was planned for an open AAA repair as an emergency. Otherwise, he had a normal baseline renal profile upon presentation to the emergency department. There was no liver function test done for this patient since it's not a routine test for a ruptured abdominal aortic aneurysm.

The abdomen was accessed through a transperitoneal open approach. Intraoperatively, the proximal control was achieved with an infrarenal clamp, while the distal control was obtained with control on the bilateral CIA. The left renal vein was preserved. Upon opening the aneurysmal sac, there was excessive venous bleeding, which turned out to be from the IVC. An ACF between the right CIA to IVC was revealed upon a proximal and distal control by a pressure application on the IVC (Figure 2). The fistula defect on the IVC was repaired with a Prolene 6/0 suture. Subsequently, an aorto-bifemoral graft (16 x 7 mm) bypass was performed due to a calcified iliac vessel. Intraoperatively, a total of 5500 mL of pack cell was transfused. The patient was nursed in the intensive care unit for 2 days, and then subsequently transferred to the general ward. His vascular examination revealed no evidence of DVT and he has palpable bilateral pedal pulses. The immediate post-op patient developed acute kidney injury which normalised after a few days. He was discharged well at 1 week post-operatively with a repeat CT scan.

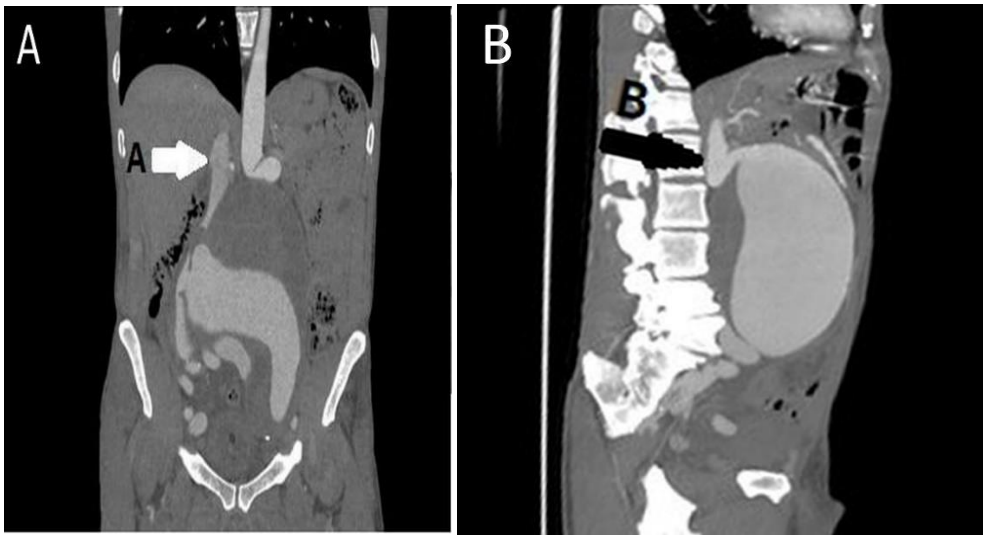


**Figure 1**. The AAA ruptured into IVC causing ACF (A) contrast flow into the IVC during the arterial phase. Giant AAA with an acute angulated infrarenal neck (B).

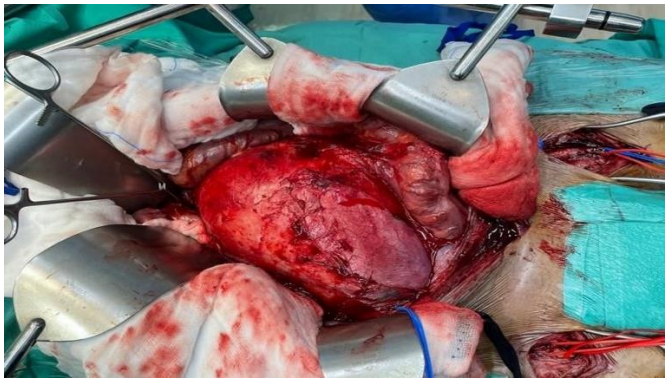

**Figure 2**. Intraoperative picture showing aortic aneurysm sac with an infrarenal control.

## DISCUSSION

The incidence of AAA is increasing and so are its complications (2). The ACF is an uncommon complication of AAA that requires urgent action. The majority of reported ACF are related to ruptured AAA. Other causes refer to penetrating trauma, mycotic aneurysms, Takayasu's arteritis, and connective tissue diseases (3). The ICV is the most common fistulous organ, followed by the iliac veins, left renal vein, and intestine (4,5).

It's always tricky to determine the aetiology of ACF whether it is a complication of a ruptured aneurysm or pre-existing due to other pathology. Clinical signs are the key to differentiating this to prevent excessive intraoperative blood loss during elective surgeries. They are difficult to identify because 20%-70% are associated with abdominal or retroperitoneal rupture where the characteristic signs (pulsatile abdominal mass, pain, signs of bleeding, abdominal murmur) are absent or may be easily misinterpreted (6). Most symptoms seem to be related to hemodynamic changes in communication.

In large-sized and high-flow ACF, symptoms of cardiac failure and sudden central venous hypertension with no clear cause may be the only findings suggesting the diagnosis (6).

Even in emergency conditions, it can present in different ways. The commonest presentation includes high-output congestive cardiac failure with warm peripheries. The initial diagnosis is based on the index of suspicion of the clinician. However, early diagnosis by the emergency physician and early surgery can markedly improve the patient's prognosis. Intracaval rupture of an abdominal aneurysm causes a sudden fall of peripheral vascular resistance with a concomitant increase of venous pressure. This leads to an increase in cardiac rhythm and stroke volume, which results in myocardial hypertrophy, sinus dilatation, and finally cardiac failure. Between 31% and 76% of the ACFs are detected during surgery after evacuating the clot from the aneurysm sac, which causes massive bleeding and/or a paradoxical pulmonary embolism (7).

Rapid intervention is crucial in patients with ACF. Open surgery and endovascular repair are the treatment options. The limitation of the endovascular approach is the emergency availability of stents is limited as it is not freely available in all centres. The literature review documented only 40 articles about AAA with ACF from 1999 through 2014, involving 67 patients, 41 surgeries, and 26 endovascular repairs. The author reported mortality in the open vs endovascular approach as 12% vs 19%. Endovascular repair presents theoretical benefits, yet is not associated with a reduced rate of complication or death versus open repair based on this review (8).

In this patient, our approach was through a transperitoneal open approach. The co-existence of giant aneurysms made the proximal infrarenal aortic control challenging. A few techniques have been described following aortic vascular control to contain the bleeding from the vena cava. Most frequently, digital or sponge compression of the IVC is obtained from within the sac, while other techniques, like insertion of occluding balloon catheters, have been described to avoid massive haemorrhage or air embolism. Prompt decision-making at this step is crucial to prevent excessive blood loss due to no vascular control over the IVC. Once the bleeding is controlled with sponge compression the defect on the IVC becomes prominent and facilitates the closure. Closure of the fistula should be done from within the aneurysm sac, using monofilament mattress sutures. In cases where this is not possible, ligation of the infrarenal IVC and/or iliac veins can be applied to obtain haemostasis (9). Complications expected after IVC ligation include leg oedema (30%), recurrent DVT (16%), venous pelvic compression syndrome, and venous claudication, although it is well tolerated in most cases (10).

In our case, the patient developed acute renal failure post op which was transient for a week and then subsequently improved to the baseline level. In an open abdominal aortic aneurysm repair, infrarenal clamping is required. Aortic clamping results in significant hemodynamic changes in fluid shift and the severity depends on the level of clamping. Infrarenal aortic clamping still has the risk of causing acute renal failure in 15% of patients compared to 37% of patients in supra renal aortic clamping (11). However judicious fluid management and vasodilators intraoperatively will help in preventing renal failure.

## CONCLUSION

Ruptured giant AAA with ACF is a life-threatening emergency that needs rapid planning and intervention. The decision for an open or endovascular approach should be based on clinicians' experiences and the availability of resources. In open surgery, various methods can be used to control the bleeding from IVC and it is paramount that clinicians are aware of this to prevent exsanguination during surgery.

**Conflict of interest**
No conflict of interest was declared by the authors.

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## REFERENCES

1. Chaikof EL, Brewster DC, Dalman RL, Makaroun MS, Illig KA, Sicard GA et al. The care of patients with an abdominal aortic aneurysm: the Society for Vascular Surgery practice guidelines. J Vasc Surg. 2009;50(4 Suppl):S2–49.
2. Potyk DK, Guthrie CR. Spontaneous aortocaval fistula. Ann Emerg Med1995:25:424–7.
3. Davis PM, Gloviczki P, Cherry Jr KJ, et al. Aorto-caval and ilio-iliac arteriovenous fistulae. American Journal of Surgery. 1998;176(2):115–8.
4. Polak A, Skarbek A. Spontaneous rupture of aortic aneurysm into inferior vena cava. Br Med J 1963;1:1717-8.
5. Davidović LB, Marković MD, Jakovljević NS, Cvetković D, Kuzmanović IB, Marković DM. Unusual forms of ruptured abdominal aortic aneurysms. Vascular. 2008;16(1):17-24.
6. Leigh-Smith S, Smith RC. Aorto caval fistula—the "bursting heart syndrome. Journal of Accident and Emergency Medicine, 2000. 17(3):223–225.
7. Cinara IS, Davidovic LB, Kostic DM, Cvetkovic SD, Jakovljevic NS, et al. Aorto-caval fistulas: a review of eighteen years experience. Acta Chir Belg. 2005;105:616-20
8. Orion KC, Beaulieu RJ, Black JH 3rd. Aortocaval Fistula: Is Endovascular Repair the Preferred Solution? Ann Vasc Surg. 2016;31:221-8.
9. Tsolakis JA, Papadoulas S, Kakkos SK, Skroubis G, Siablis D, Androulakis JA. Aortocaval fistula in ruptured aneurysms. European Journal of Vascular and Endovascular Surgery, 1999;17(5):390-3.
10. Cranley JJ, Krause RJ, Strasser ES, Hafner CD. Results of vena cava ligation. Journal of Cardiovascular Surgery. 1972;13(5):403-408.
11. Yokoyama N, Nonaka T, Kimura N, Sasabuchi Y, Hori D, Matsunaga W, et al. Acute kidney injury following elective open aortic repair with suprarenal clamping. Ann Vasc Dis. 2020;13(1):45-51.